

Baryonic Oscillation Spectroscopic Survey at Brookhaven

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U.S. DEPARTMENT OF
ENERGY

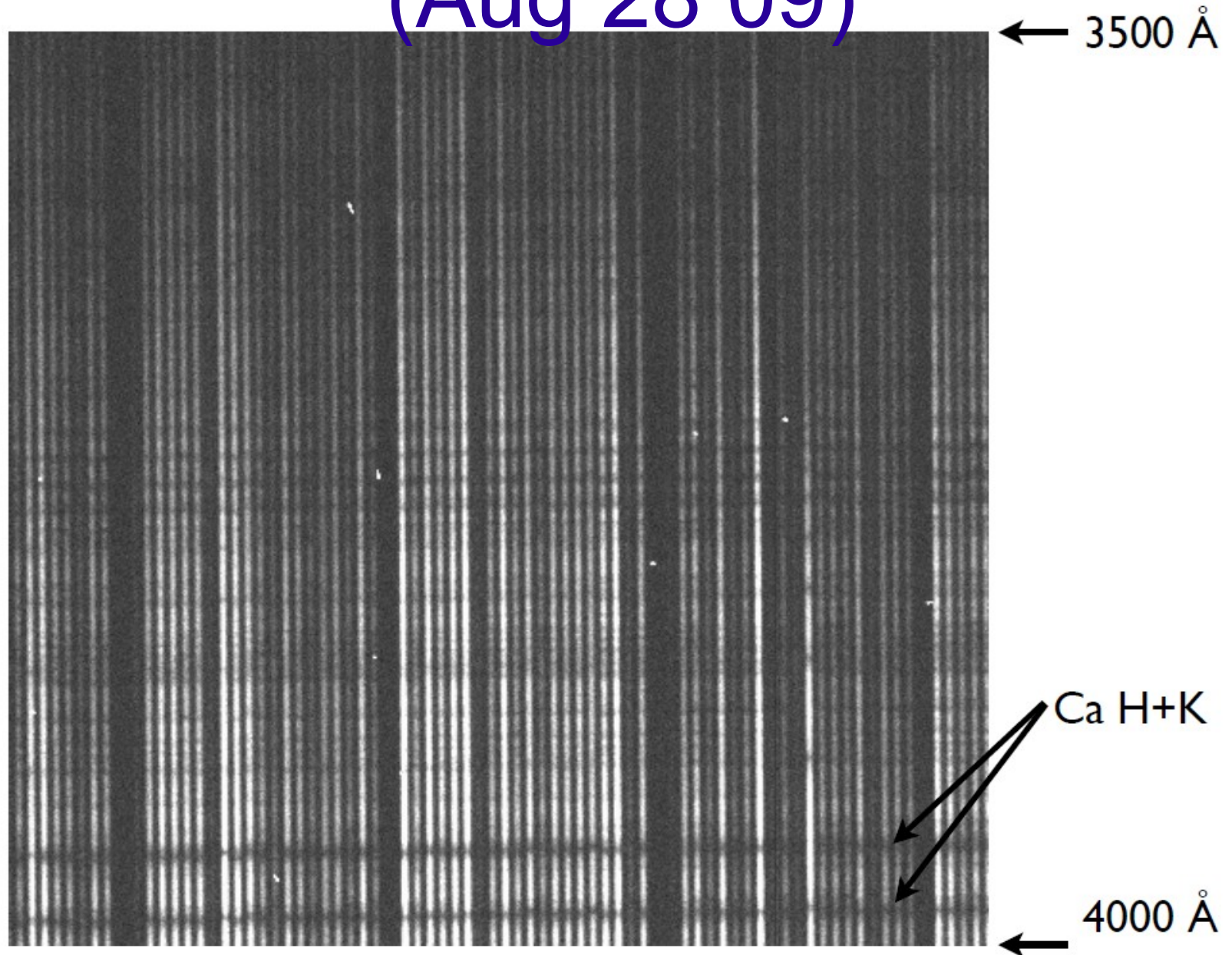
Office of
Science

SDSS 3

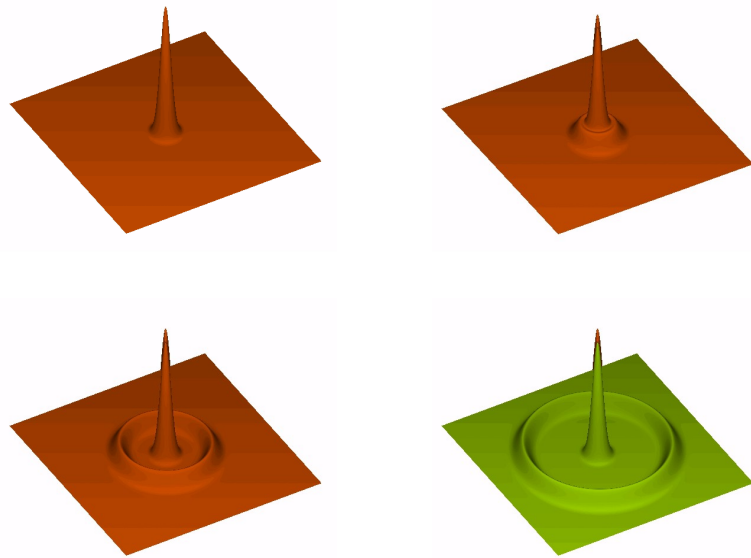
- **B**aryonic **O**scillations
Spectroscopic **S**urvey is one of 4 experiments within the SDSS3 collaboration.
- A 1000 fiber UV-mid IR spectrograph on SDSS telescope
- Fall 2008 – Spring 2014
- BNL is a member in SDSS 3 with sole focus on the BOSS experiment.



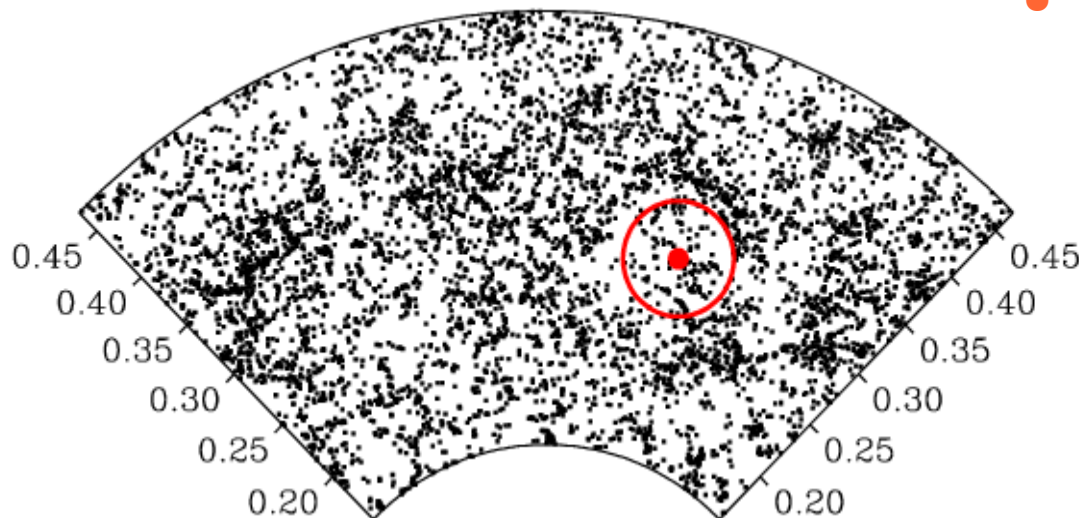
BOSS instrument first light on sky (Aug 28 09)



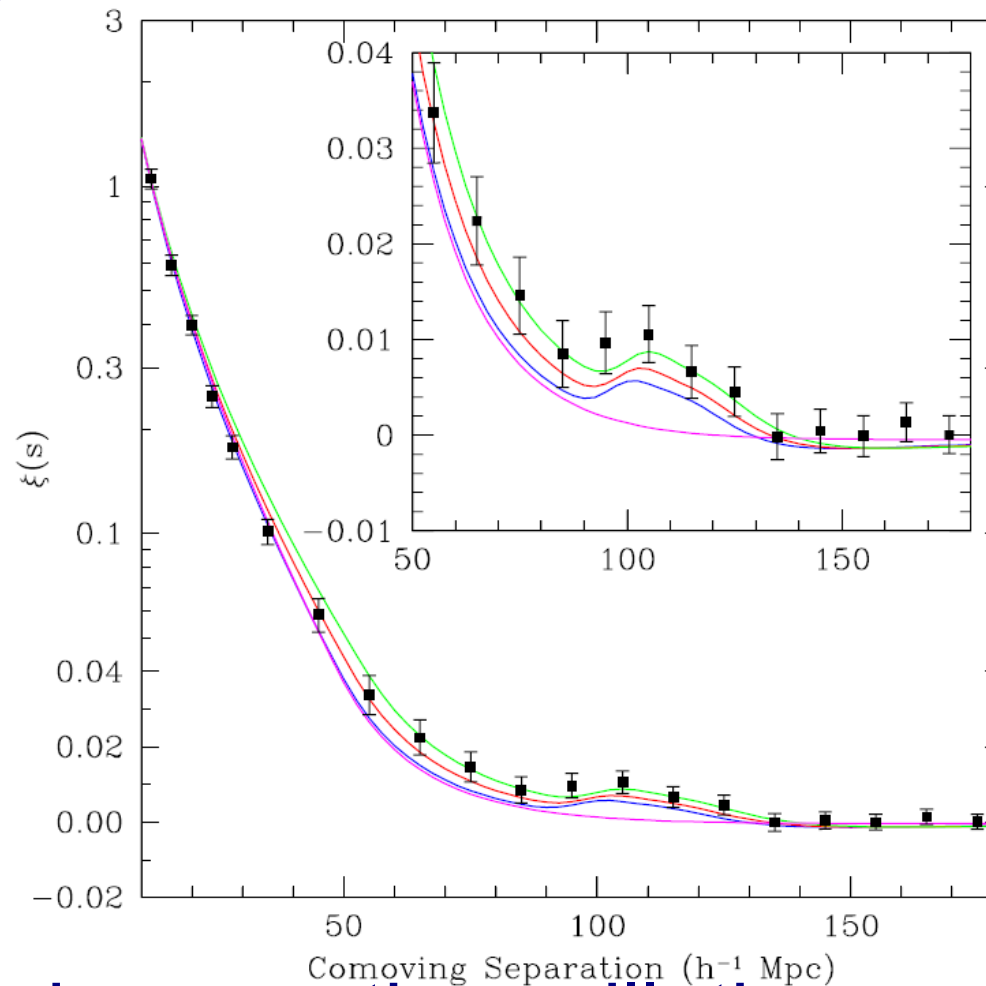
Baryonic acoustic oscillations



- Before decoupling of baryons and photons, plasma can support acoustic waves
- These imprint a characteristic scale into the correlation properties of dark matter



Baryonic acoustic oscillations



SDSS data
From Eisenstein
et al, 2005

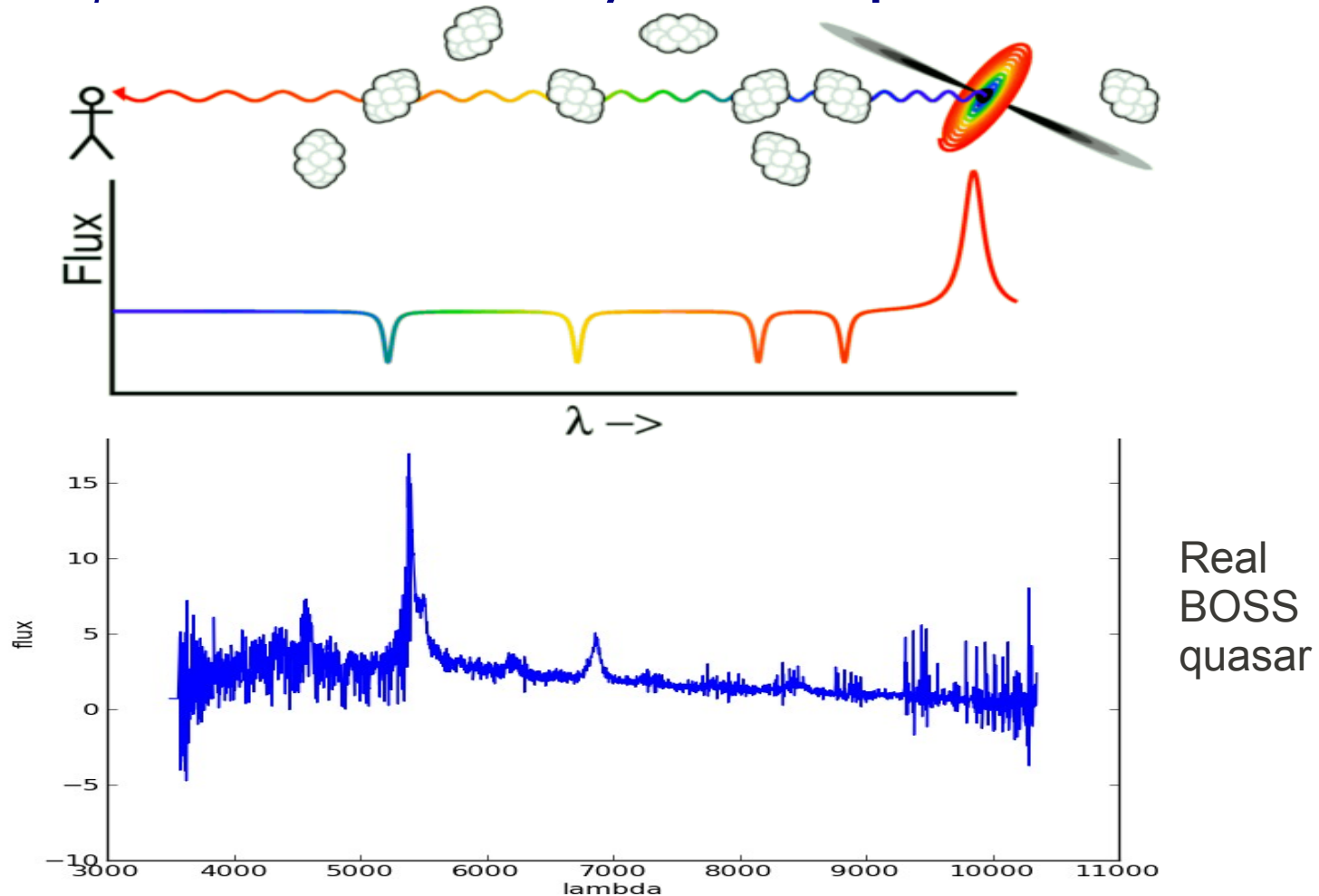
- Baryonic acoustic oscillations are a standard rod allowing measurements of the expansion history of the Universe

BOSS

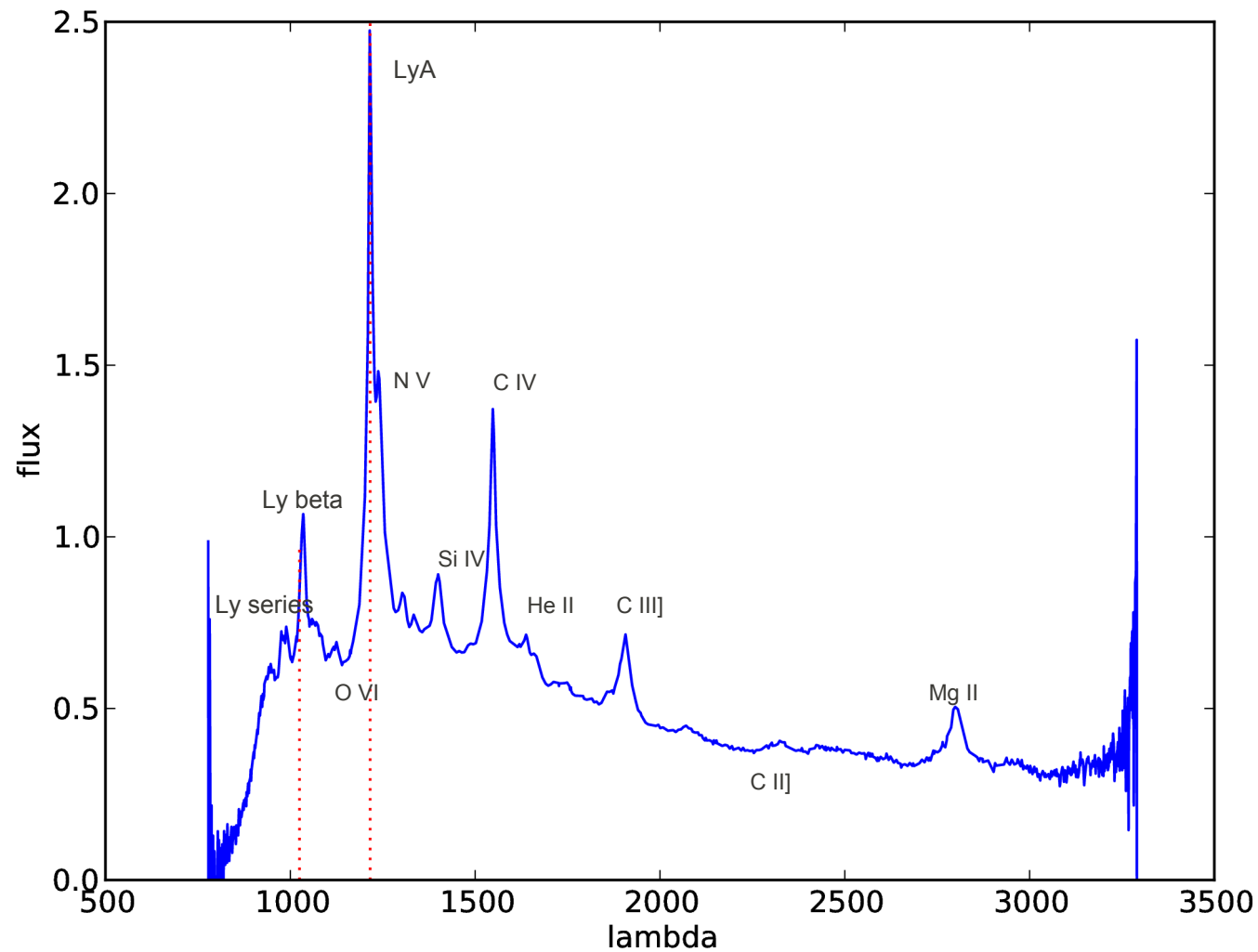
- Goal is to measure BAO using:
 - Redshifts of 1.5 million luminous galaxies to $z = 0.7$ over 10000 square degrees
 - Lyman- α forest spectra of 160,000 quasars at redshifts $2.2 < z < 3$

Lyman-alpha forest

- clouds of hydrogen absorb light from distant quasars, blueward of Lyman-alpha emission

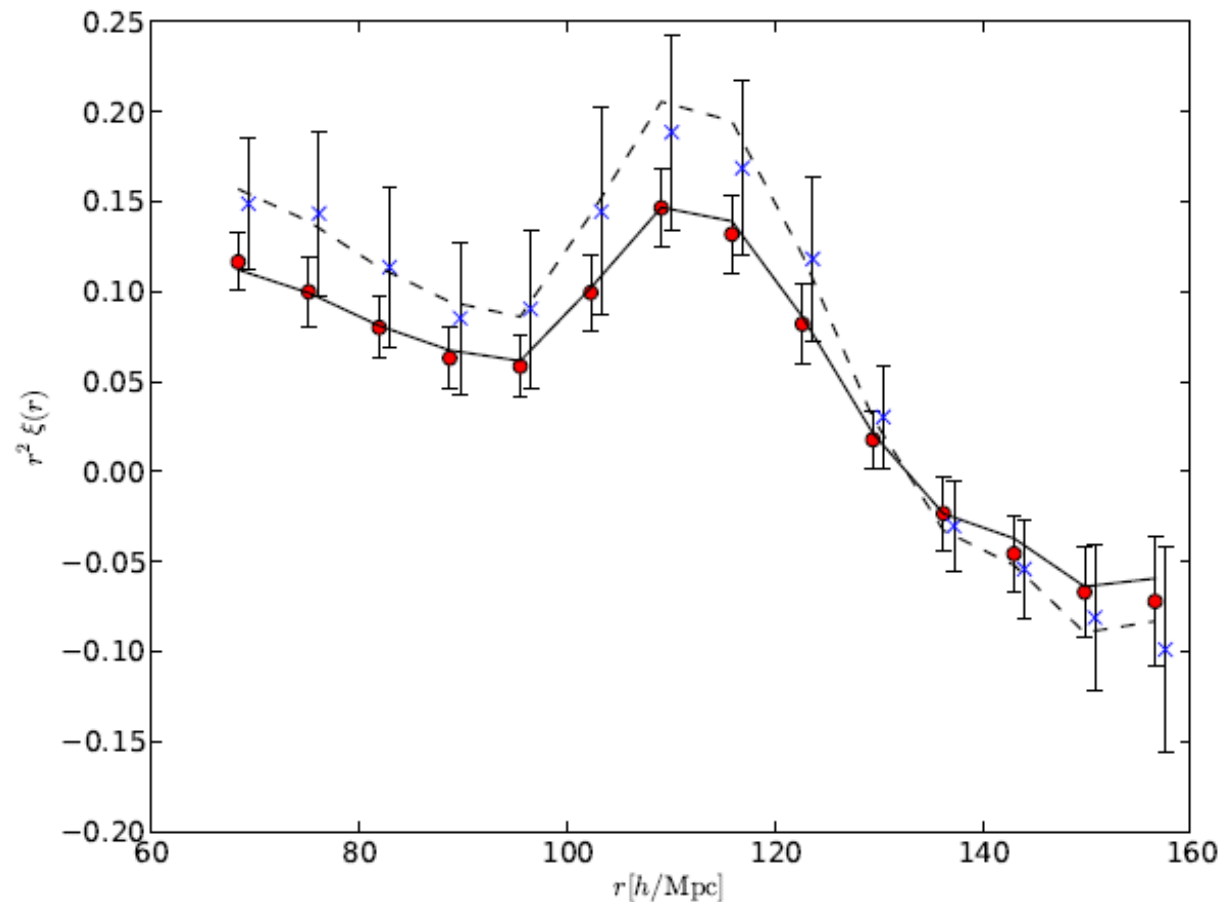
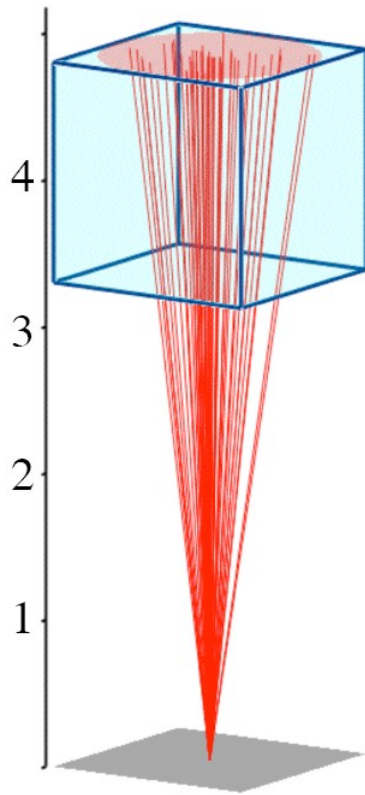


4800 BOSS QSOs



BOSS average rest frame spectrum

BAO with Lyman-alpha forest



Slosar et al, 2009

- BAO never done with Ly-A forest before
- Simulations indicate that it should work

Current Status

- After initial hiccups the instrument is up and running
- QSO selection efficiency somewhat lower than hoped for (~ 15 / sq deg rather than ~ 20 / sq deg), but within specifications
- We expect around 15,000-20,000 QSOs by the end of year 1.

Lyman-alpha forest analysis collaboration

Berkeley:

- Nic Ross, Shirley Ho, Nao Suzuki, Martin White
- data inspection, mock catalogues, simulations, PCA continua

Ohio:

- Mat Pierri, David Weinberg
- Metals, interface with SDSS management

French participation group:

- Patrick Petitjean, JM Le Goff, Eric Aubourg, ...
- data inspection, BAL, DLA identification, continuum fitting, FPG QSO VAC

Yale:

- Brit Lundgren
- Metals, BAL/DLA simulation

Barcelona:

- Andreu Font, Jordi Miralda-Escude
- mock spectra, auxiliary science

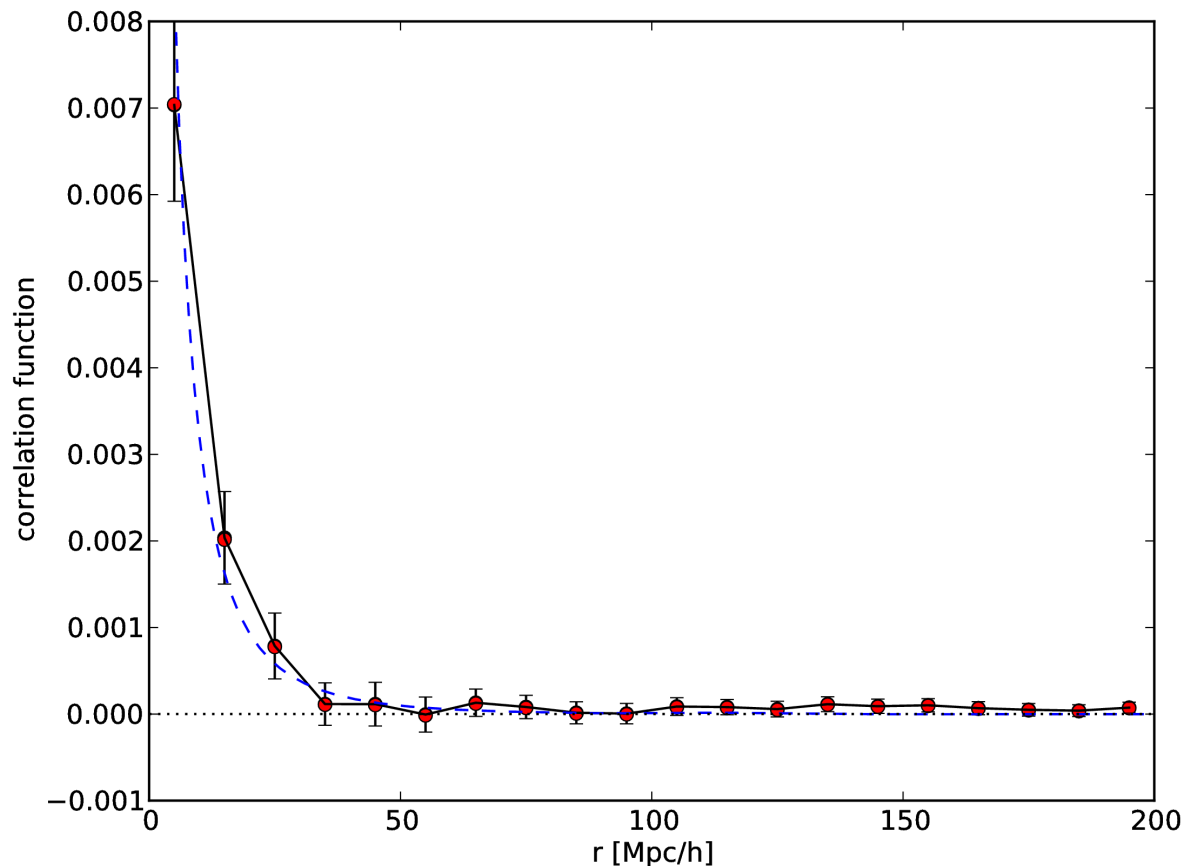
Brookhaven:

- Anže Slosar (convener of LYA Cosmology WG)
- Main correlation function pipeline, creation of post-processed catalogs

Pittsburgh:

- Rupert Croft (convener of LYA IGM WG)
- auxiliary science, simulations

Current Status



4800 BOSS sightlines, normalised to $z=2.5$

- Correlations detected in transverse quasar pairs with >6 sigma significance.
- Reduction tools and methods progressing well.
- First publications expected by the end of 2010.